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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/587,955	CARTWRIGHT, PETER S.	
	Examiner	Art Unit	
	KATHERINE ZALASKY	1797	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 November 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,9 and 17* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7, 9 and 17* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claims 1-7, 9 and 17, as amended 16 November 2009, are currently pending. **Claims 8 and 10-16** are cancelled.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. **Claims 1-7, 9 and 17** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

3. As written, the claims are now directed to "two independently controlled processes". Unless the claims have an explicit process step which links the two processes, the claims are considered indefinite. It is suggested that the claims include language to the effect of "A method comprising two independently controlled water treatment processes comprising a first process…and a second process…," with similar modifications to the dependent claims. Additionally, the claims must include a positive recitation of the link between the two processes, such as "wherein the brine for regenerating the softening tank is produced by the nanofiltration process", or similar language to the same effect.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. **Claims 1-2, 6-7, 9 and 17** are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen (US 6,666,971) in view of Lien (US 6,004,464).

Regarding **claims 1 and 2**, Chen discloses two water treatment processes (abstract) comprising a first process for removing multivalent hardness ions from water (Figure 5, C2/L2-16) and a second process for removing monovalent ions from the brine water to a predetermined level (Figure 4, C2/L2-16, C2/L32-42), wherein said first process utilizes a softening tank through which the water to be softened passes from an upstream to a downstream end (Figure 5, primary softener 12), a brine tank for holding a monovalent regenerating brine solution (Figure 5, treated brine tank 121), a first diverter valve connected between the brine tank and the upstream end of the softening tank (Figure 5, flow control valve 314) and a second diverter valve on the downstream end of the softening tank (Figure 5, flow control valve 24), and wherein said first process comprising the steps of:

a) operating the first diverter valve to pass brine solution from the brine tank through the softening tank of the water softening system (C6/L57-67)

b) operating the second diverter valve to direct liquid from the downstream end of the softening tank (C6/L57-67, C4/L34-35)

Additionally, Chen discloses that in said second process (Figure 4), the processing system is further of the type that includes a nanofilter, having upstream and downstream sides,

for passing monovalent ions to the downstream side of the nanofilter and retaining multivalent ions on the upstream side of the nanofilter (Figure 4, C5/L48-52); further including a connection between the downstream side of the nanofilter and the brine tank (C6/L15-52, Figures 4 and 5), and a pump receiving brine solution and supplying brine solution to the nanofilter (Figure 4, pump 202), and including the steps of:

b) directing the liquid on the downstream side of the nanofilter to the brine tank (Figures 4 and 5, C6/L15-52)

c) directing the liquid on the upstream side of the nanofilter to a drain (Figure 4, C6/L15-52)

d) powering the pump concurrently with operating the second diverter valve (C6/L24-27, pump and valve action together)

However, the reference does not disclose that the two processes are independently controlled from each other, that the second diverter valve connects the downstream end of the softening tank selectively to the upstream side of the brine tank, or that during (b) the liquid is directed from the downstream end of the softening tank to the brine tank. Further, the reference does not disclose that the pump receives the brine solution from the brine tank to be fed to the nanofilter or the step of directing liquid from the brine tank to the nanofilter. Rather, the reference indicates that the brine directed from the downstream end of the softener is injected directly into a nanofiltration system (Figures).

Lien discloses a method of reclaiming spent aqueous brine solutions which have been used in the regeneration of water-softening resins (abstract). The reference discloses that the spent brine from the regeneration process is ideally directed to a brine feed tank (Figure 1, tank 11) where the brine can be analyzed for hardness and other properties (C3/L25-46). By taking the time to measure the properties, one would be able to pre-treat the brine, if necessary, prior

to nanofiltration so that the highest level of recovery can be achieved (C3/L25-46, C3/L64-C4/L10, C5/L21-28). Additionally, the reference discloses that once the brine has been purified to remove the multivalent ions, it may be directed to a clean brine tank and is once again suitable for use in water-softener regeneration processes (C4/L45-57, C5/L50-52).

It would have been obvious to one having ordinary skill in the art at the time of the invention to incorporate a spent brine collection tank after the water softener and second diverter valve, thus providing a stopping point for the liquid to be tested for hardness and other properties in the method of Chen, as taught by Lien, since doing so will allow the spent brine to be treated as necessary prior to nanofiltration, increasing the efficiency of filtration and providing for the highest possible recovery yield. Further, the addition of a spent brine collection tank into the method of Chen constitutes nothing more than the combination of known prior art elements into a known configuration in order to achieve a predictable result.

While the combination of references does not suggest that a single brine tank is used to connect the first and second processes, it would have been obvious to one having ordinary skill in the art to form an integral brine tank with two sections, one for cleaned brine and one for spent brine. Making elements integral is generally recognized as being within the level of ordinary skill in the art. *In re Larson*, 340 F.2d 965, 968, 144 USPQ 347, 349 (CCPA 1965).

Regarding **claim 6**, modified Chen discloses all of the claim limitations as set forth above. Additionally, Chen discloses the process including the step of directing the fluid from the brine tank to the nanofilter (Figure 4, C6/L15-52). While the reference does disclose that the treated brine leaving the nanofilter will have a bivalent ion concentration ranging from 500 to 1000 ppm (C2/L32-42, 0.05-0.1%), it does not disclose that the nanofilter has a maximum of approximately 20% monovalent salts rejection. Rather, the reference teaches that the nanofilter will typically pass 50% of the volume through the nanofilter, thereby only recovering 50% of the

monovalent salt content. In order to obtain a higher salt content, the rejected liquid may be passed through an additional nanofilter (Figure 4, C6/L39-51). It would have been obvious to one having ordinary skill in the art to use multiple nanofilters in order to obtain the desired salt content.

Regarding **claim 7**, modified Chen discloses all of the claim limitations as set forth above. Additionally, the reference discloses the process wherein the water softening system includes a valve connected to the upstream side of the nanofilter, and including the step of maintaining a higher pressure on the upstream side of the nanofilter than in the brine tank (Figure 4, valve 204, C6/L24-26). While the reference does not explicitly disclose that the valve is a throttling valve, it is well known in the art to use throttling valves prior to membrane filtration systems (as evidenced by Kohler, US 4,321,137, Figure, throttle 10, C2/L50-55). Therefore, it would have been obvious to one having ordinary skill in the art to choose to employ a throttle valve in the system of Chen since doing so represents a choice from a finite number of predictable solutions for a valve positioned upstream of a membrane filtration unit.

Regarding **claim 9**, modified Chen discloses all of the claim limitations as set forth above. Additionally, Chen discloses the process including the step of maintaining the concentration of the brine in the brine tank above approximately 10% (C5/L61-C6/L3).

Regarding **claim 17**, modified Chen discloses all of the claim limitations as set forth above. Additionally, Chen discloses the process including the step of maintaining the concentration of the brine in the brine tank above a predetermined concentration (C5/L61 - C6/L3).

7. **Claims 3-5** are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen (US 6,666,971) and Lien (US 6,004,464), as applied to **claims 1 and 2** above, and further in view of Le Dall (US 4,275,448).

Regarding **claims 3-4**, modified Chen discloses all of the claim limitations as set forth above. Additionally, the reference discloses the first process wherein the water softening system includes a third diverter valve receiving the brine solution from the second diverter valve (Figure 3, sensor S_1, valve prior to brine tank, C5/L53-C6/L14). The reference does disclose that a sensor is used to measure the salt concentration or other variables in the stream, but does not explicitly disclose that the process includes the step of directing liquid from the second diverter valve away from the brine tank responsive to a predetermined condition. Moreover, the reference does not disclose that when the salinity concentration is below the predetermined level the liquid is directed from the second diverter valve away from the brine tank. Rather, Chen teaches that when the salt concentration does not fall between 10-15%, the salt content is adjusted in the brine tank by adding salt when the salinity is low or by adding fresh water when the salinity is high (C5/L53-C6/L14).

Le Dall discloses a method of ion exchange regeneration which includes a brine conductivity sensor to determine whether the brine is still suitable for regeneration. If the controls determine that the brine is unsuitable, the system either discards the brine using a diverter valve or reprocesses the fluid (abstract, C2/L50-57).

It would have been obvious to one having ordinary skill in the art at the time of the invention to try diverting the liquid away from the brine storage tank instead of adjusting the salt content in the brine tank of modified Chen, as taught by Le Dall, since doing so represents nothing more than the choice between a finite number of identified, predictable solutions for handling liquids with undesirable properties.

Regarding **claim 5**, modified Chen discloses all of the claim limitations as set forth above. Additionally, the reference discloses the process wherein the water softening system includes a third diverter valve receiving the brine solution from the second diverter valve (Figure

3, sensor S_1, valve prior to brine tank, C5/L53-C6/L14). However, the reference does not disclose the steps of timing from the start of the operating step for the second valve and responsive to said timing exceeding a predetermined time, directing fluid from the second diverter valve away from the brine tank.

Le Dall discloses that in addition to conductivity measurements, the time of the regeneration processes may be kept and compared to a pre-set length of time in the electronic controller. In the event that the time for the process reaches the pre-set length of time the electronic controller will suspend operation to prevent any damage to the system (C13/L18-50). It would have been obvious to one having ordinary skill in the art at the time of the invention to use a clock function in the method of modified Chen to time the regeneration process in the water softener and compare the time to a pre-set length of time, as taught by Le Dall, since doing so adds an additional check on the process to ensure proper operation of the system.

While neither Chen, Lien nor Le Dall explicitly disclose that the liquid stream is diverted from the system in response to the time reaching the pre-set length of time, it would have been obvious to one of ordinary skill that the liquid may be diverted from the system instead of simply shutting the system off. The choice to divert liquid from the system will both prohibit an excess volume of liquid from entering the brine storage tank and prohibit any brine which may not meet quality standards from returning to the brine tank and damaging the proper operation of the system.

Response to Arguments

8. Applicant's arguments with respect to **claims 1-7, 9 and 17** have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to KATHERINE ZALASKY whose telephone number is (571) 270-7064. The examiner can normally be reached on 7:00am - 12:00m Monday and Friday and 7:30am - 6:00pm Tuesday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Vickie Kim can be reached on (571)272-0579. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Krishnan S Menon/
Primary Examiner, Art Unit 1797

/KZ/
19 January 2010